

## PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P 2003 01887 WO1	<b>FOR FURTHER ACTION</b> See Form PCT/PEA/416	
International application No. PCT/DK2005/000048	International filing date (day/month/year) 24.01.2005	Priority date (day/month/year) 23.01.2004
International Patent Classification (IPC) or national classification and IPC INV. H01Q1/42 B64D45/02		
Applicant LM GLASFIBER AS et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input checked="" type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand  21.11.2005	Date of completion of this report  03.04.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Frias Rebelo, A  Telephone No. +49 89 2399-7451 	

International application No.  
PCT/DK2005/000048

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

1-15 filed with telefax on 21.11.2005

1-18 filed with telefax on 21.11.2005

**1/7-7/7** **as originally filed**

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. IV Lack of unity of invention**

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1. ☐ In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
  - ☐ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☐ neither restricted nor paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☒ all parts.
  - ☐ the parts relating to claims Nos. .

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-18
	No: Claims	
Inventive step (IS)	Yes: Claims	1-18
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item IV**

**Lack of Unity of the Invention**

1. The present application does not meet the requirement of Unity (Rule 13.1 PCT) for the following reasons:

1.1 The following separate groups of inventions are found for the present application:

- Claims 1-9,18 which refer to a method to produce a lightning diverter comprising a layer of electrically non-conductive material with a plurality of isolated segments of electrically conductive material, as well as a blade for a wind turbine equipped with a lightning diverter strip produced according to the method claimed in claims 1-9.
- Claims 10-17, which refer to a lightning diverter comprising a layer of electrically non-conductive material with a plurality of isolated segments of electrically conductive material, where the exposed parts of said segments are described by concave shapes

1.2 The common subject-matter of the present application refers to the problem of providing an improved lightning diverter to be placed on structures such as wings on wind turbines, aircraft components, radomes, etc, where the lightning diverter comprises a layer of electrically non-conductive material with a plurality of isolated segments of electrically conductive material.

The devices mentioned above as well as the problem addressed therewith are known in the prior art - see e.g. US 4506311-, which is also acknowledged by the applicant (see e.g. description, page 3, lines 6-8)

1.3 Further to the paragraph above, the special technical features, in the sense of Rule 13.2 PCT, intended to define a contribution of the present application over the prior art are:

- According to claim 1, a method of producing a lightning diverter comprising the steps of: (a) making a plurality of holes in a plate of an electrically conductive material; (b) filling said holes, at least partially with one or more electrically conductive

materials; (b) dividing the plate thereby obtaining a layer of electrically non-conductive material with a plurality of isolated segments of electrically conductive material.

- According to claim 10 by a lightening diverter where the exposed parts of the segments of conductive material are described by concave shapes.

1.4 Under these circumstances it must be stated that the following groups of inventions are not so linked as to form a single general inventive concept.

- The method of claim 1 and the appended dependent claims 2-9, as well the blade turbine of claim 18 due its dependence on claims 1-9;
- The lightning diverter of claim 10 and the appended dependent claims 11-17

**Re Item V.**

**Reasoned Statement with regard to Novelty, Inventive Step or Industrial Applicability.**

1. Independent claim 10 is clear (Article 6 PCT) in view of the arguments stated by the applicant with letter dated 16.03.2006.

From the above, it also follows that dependent claims 11-17 are clear (Article 6 PCT).

2. In the following, reference is made to the following documents:
  - D1: US-A-4 583 702 (BALDWIN ET AL) 22 April 1986 (1986-04-22)
  - D2: US-A-4 506 311 (CLINE ET AL) 19 March 1985 (1985-03-19)
  - D3: WO 01/77527 A (JOMITEK APS; JOHANSEN, OLUF, PETER, KAAD; SOERENSEN, TROELS) 18 October 2001 (2001-10-18)
  - D4: US-A-4 237 514 (CLINE ET AL) 2 December 1980 (1980-12-02)
  - D5: US-A-3 416 027 (AMASON ET AL) 10 December 1968 (1968-12-10)

In paragraph 3. below, reference is made to the first invention, i.e. to the method of independent claim 1 and the appended dependent claims 2-9, as well the blade turbine of dependent claim 18.

3. The method of claim 1 fulfils the requirements of Article 33 (2), (3) and (4) PCT regarding novelty, inventive step and industrial applicability. The reasons are as follows:

3.1 Document D1, which is considered to represent the most relevant state of the art for the subject-matter of claim 1, (the references in parentheses applying to this document) implicitly discloses a method for producing a lightning diverter comprising the step of forming a plurality of holes in a aluminium foil in the form of a strip (see e.g. fig.2, 3; column 1, lines 26 to 30).

The method of producing a lightning diverter of independent claim 1 differs from the one known from D1 in that it further comprises the steps of

- (a) filling said holes, at least partially with one or more electrically conductive materials;
- (b) dividing the plate thereby obtaining a layer of electrically non-conductive material with a plurality of isolated segments of electrically conductive material.

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT)

3.2 The problem to be solved by the method of claim 1 may be regarded as to provide method for producing an improved lightning diverter. With said method, a lightning arrester with improved mechanical properties (e.g. stiffness, resistance to failure) and durability is obtained.

Other pertinent prior art does not disclose or render obvious the additional method steps (a) and (b) as mentioned above. D2 discloses a method of producing a lightning diverter strip where a plurality of isolated segments of electrically conductive material are fixed on the layer of a non-conductive material; D3 makes reference to

the addition of an adhesive layer attached to a copper lightning diverter and the use of such diverters in wind turbines; D4 refers to a lightening diverter strip including a base or substrate formed of polyester tape having a surface adapted to be applied directly to the aircraft component to be protected, and bonded thereto by suitable epoxy.

Therefore, the method of claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT).

- 3.3 The method of claim 1 is used for producing a lightning diverter that can be placed on structures such as e.g. wings on wind turbines, aircraft components or radomes.

Therefore the method of claim 1 is considered to be industrially applicable (Article 33(4) PCT).

- 3.4 Claims 2-9, 18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty, inventive step and industrial applicability (Article 33(2), (3) and (4) PCT).

In paragraphs 4. below, reference is made to the second invention, i.e. to the lightning diverter of independent claim 10 and the appended dependent claims 11-17.

4. The lightning diverter of claim 10 fulfils the requirements of Article 33 (2), (3) and (4) PCT regarding novelty, inventive step and industrial applicability. The reasons are as follows:

- 4.1 Document D2, which is considered to represent the most relevant state of the art for the subject-matter of claim 10 (the references in parentheses applying to this document), discloses a lightning diverter strip for conducting a lightning-induced electrical current and to be placed on structures such as e.g. aircraft radomes with the purpose of lightning protection, where the diverter comprises a base of di-electric material (e.g. based on a epoxy resin matrix) provided with e.g. diamond-shaped

conducting segments arranged longitudinally on the strip in space apart relation ( see e.g figure 1; column 3, line 16-29 )

The lightning diverter of independent claim 10 differs from the one known from D2 in that

- the exposed parts of said segments are described by concave shapes.

The subject-matter of claim 10 is therefore novel (Article 33(2) PCT).

- 4.2 The problem to be solved by the subject-matter of claim 10 may be regarded as to provide a lightning diverter with, e.g., an improved design that exhibits e.g. improved properties and performance. In an lightning diverter of claim 10, the conductive segments have a better connectivity and attachment to the surrounding non-conductive material, thereby ensuring improved operation stability and life-time behaviour of the diverter.

Other pertinent prior art does not disclose or render obvious a diverter where the exposed parts of said segments are described by concave shapes. D5 discloses different designs of diverter strips for radomes for lightning protection such as: strips with button-shaped segments rivetted along the centerline of the strip; or diverter strips with several layers of materials in which segments of metallic wire are embedded so that their ends are exposed at certain intervals. In both cases, the exposed parts of the conducting material are described by non-concave shapes.

Therefore, the lightning diverter of claim 10 of the present application is considered as involving an inventive step (Article 33(3) PCT).

- 4.3 The lightning diverter of claim 10 can be placed on structures such as e.g. wings on wind turbines, aircraft components or radomes, hence preventing detrimental effects related e.g. with lightening strokes.

Therefore the lightning diverter of claim 10 is considered to be industrially applicable (Article 33(4) PCT).



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- 4.4 Claims 11-17 are dependent on claim 10 and as such also meet the requirements of the PCT with respect to novelty, inventive step and industrial applicability (Article 33(2),(3) and (4) PCT).